NATIONAL PETROLEUM RESERVE IN ALASKA

GEOLOGICAL REPORT

KOLUKTAK TEST WELL NO. 1

HUSKY OIL NPR OPERATIONS, INC.
Prepared by: R. G. Brockway
Edited by: Gordon W. Legg

For the

U. S. GEOLOGICAL SURVEY
Office of the National Petroleum Reserve in Alaska
Department of the Interior
AUGUST 1983

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INTRODUCTION

The Koluktak Test Well No. 1 is located in protracted Section 27, T5N, R11W, Umiat Meridian, approximately 67 miles northwest of Umiat, Alaska (Figures 1 and 2). The well was spudded on March 23, 1981, and terminated at a depth of 5,882 feet on April 15, 1981. Only the Cretaceous rocks of the Nanushuk Group and the upper part of the Torok Formation were drilled. Shows of hydrocarbons were minor and none were tested.

No conventional cores were cut. Thirty sidewall cores were shot and 24 were recovered.

PRE-DRILLING PROGNOSIS

The primary objective of the Koluktak No. 1 was to test seismically defined hydrocarbon indicators in the lower Nanushuk Group sandstones (Figure 3). The well was located on the east-plunging nose of a seismic high with a local crest about 12 miles to the west of the location (Figure 4). This nose forms the eastern part of the Oumalik anticlinal trend. Structural closure was determined on the north, east, and south. To the west, closure was inferred to be stratigraphic based on the pattern of hydrocarbon indicators seen on the seismic sections.

The anticipated Nanushuk reservoir rocks were sandstones, mostly in thin beds, with an aggregate thickness of about 400 feet. These beds probably were deposited in a transitional and marine environment. A secondary objective in the well was the sandstones in the upper part of the Torok Formation.

Source rocks of any hydrocarbons would likely be the interbedded shales of the Nanushuk Group and those of the underlying Torok Formation.

POST-DRILLING SUMMARY

The Koluktak Test Well No. 1 penetrated 3,837 feet (below conductor casing) of Nanushuk Group rocks and 1,935 feet of the Torok Formation. Many thin sandstones were encountered as predicted. Several sandstone units were greater than 20 feet thick; and the maximum thickness was 150 feet. Generally, the thicker units had shale and siltstone interbeds. Major sandstone development was primarily limited to the Grandstand Formation of the Nanushuk Group.

Porosity was observed in several of the sandstones and some had minor shows of gas. The maximum porosity was 23% as indicated on the neutron porosity log at 1264-1283'. The best of the gas shows was from a sandstone unit at 3724-3742', where 2,560 units were recorded. A 1.4 pound per gallon increase in mud weight was required to contain the gas. All porous zones examined were computed to be water wet.

Fluorescence and cut were limited to very poor shows in the interval 1560-1660'.

Structurally, the Koluktak Test Well No. 1 was lower than either the East Oumalik No. 1 or the Titaluk No. 1, as was predicted (Figure 4). If correlations are correct, then the Koluktak well is 500 feet lower on the top of the Grandstand Formation than the East Oumalik and 335 feet lower than the Titaluk No. 1. It appears that a stratigraphic trap is not present in the vicinity of the Koluktak Test Well No. 1.

The Koluktak Test Well No. 1 was not tested because of the lack of good hydrocarbon shows and because computations indicated the porous zones were water saturated. The well was plugged and abandoned.

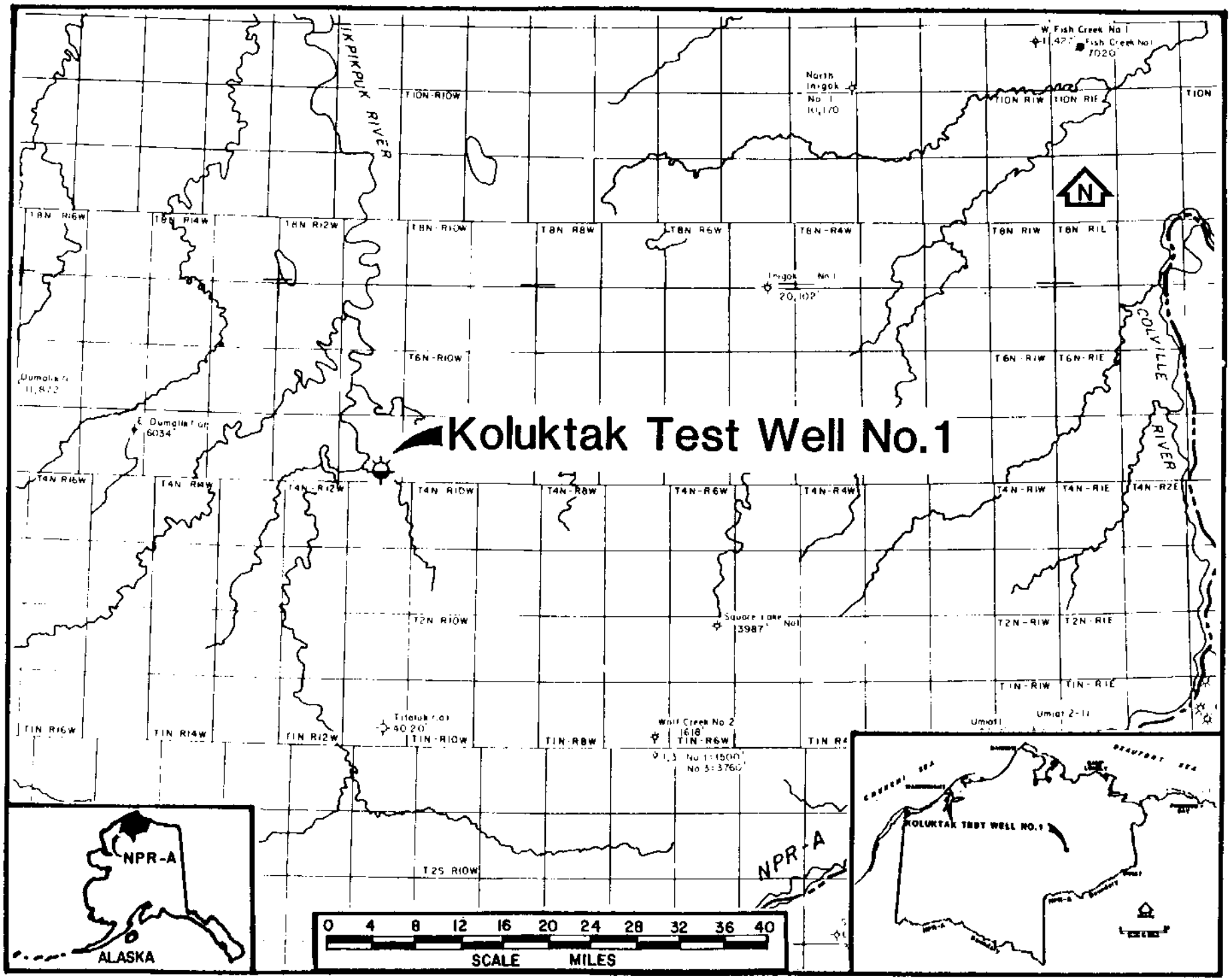
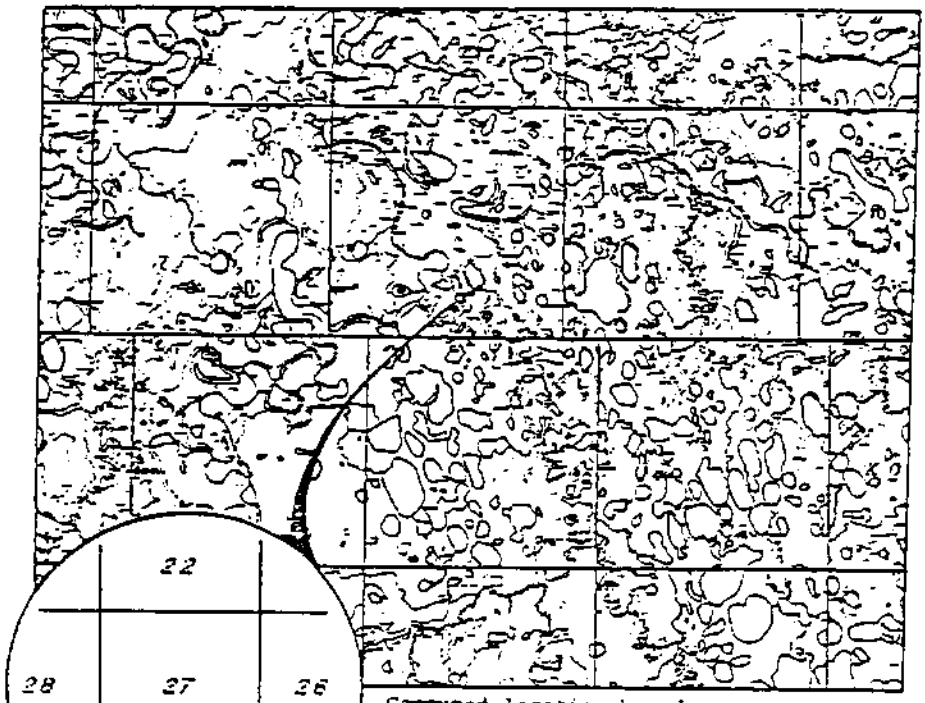
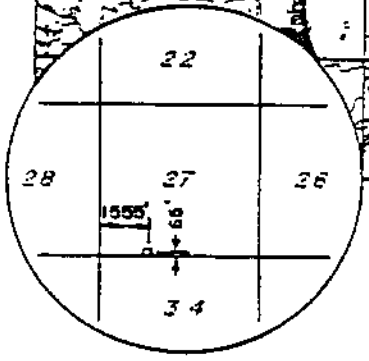


FIGURE 1 - LOCATION MAP - KOLUKTAK TEST WELL No. 1





Computed location based on data from Barr Automated Surveys, Inc. to Husky Oil NPR Operations, Inc. dated Aug. 11, 1979, a copy of which is on file with Tectonics, Inc., Anchorage, AK.

KOLUKTAK 4-80

LAT. = 69°45'08.62"
LONG. = 154°36'40.12"
Y = 5,759,254.45
X = 422,531.28
ZONE 5

0 2 4 8
SCALE MILES

CERTIFICATE OF SURVEYOR

I hereby certify that I am properly registered and licensed to practice land surveying in the State of Alaska and that this plat represents a location survey made by me or under my supervision, and that all dimensions and other details are correct.

AS STAKED

KOLUKTAK TEST WELL No. 1

LOCATED IN

SW 1/4 PROTRACTED SEC. 27, T5N, R11W, UMIAT MERIDIAN, AK.

SURVEYED FOR

HUSKY OIL

N.P.R. OPERATIONS, INC.

TECTONICS INC.

P.O. BOX 4-2265, ANCHORAGE, AK 99509

FIGURE 2 - SURVEYOR'S CERTIFICATE - KOLUKTAK TEST WELL NO. 1

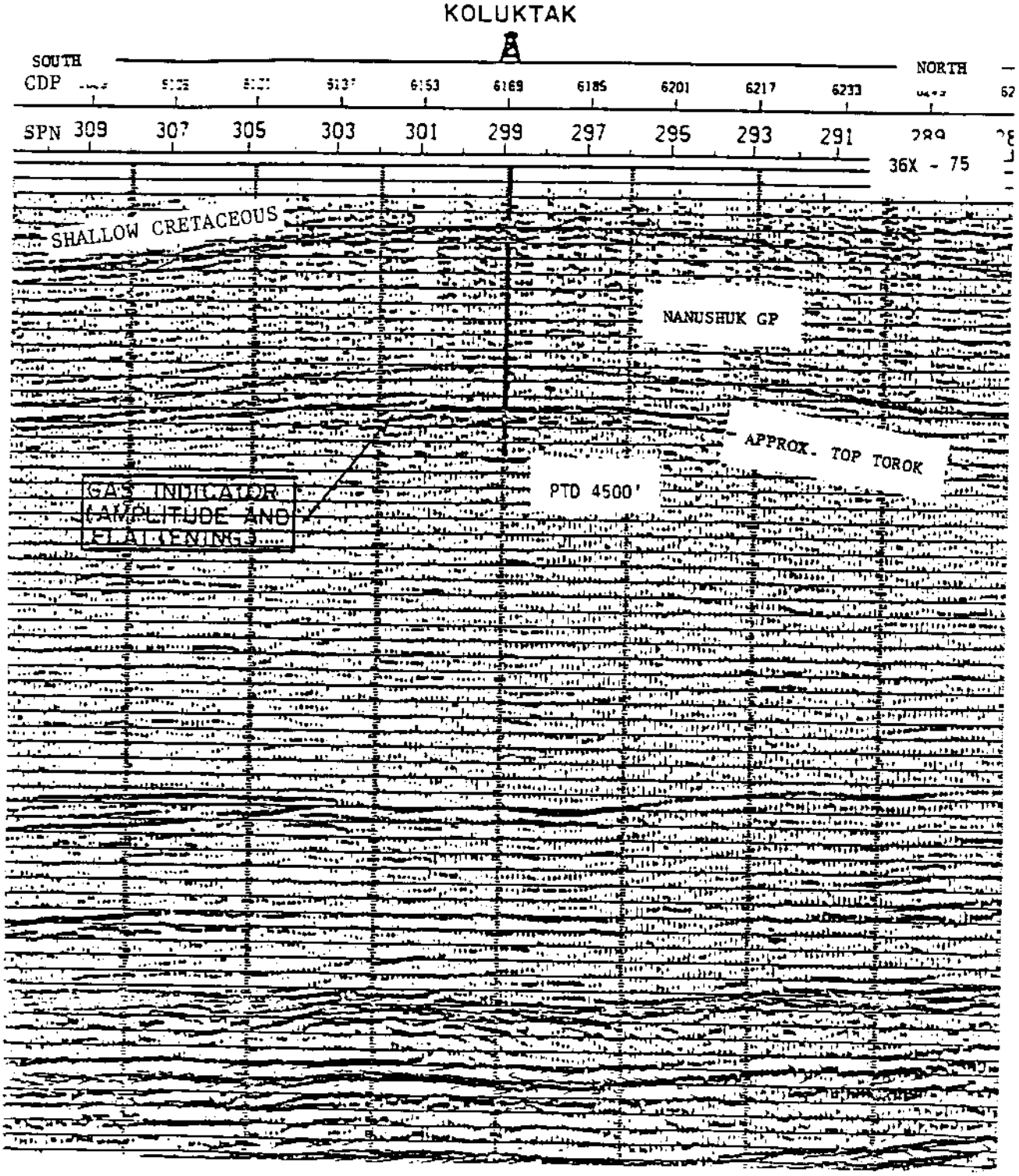


FIGURE 3 - SEISMIC LINE 36X-75-G-1186 (G.S.I.)
KOLUKTAK TEST WELL NO. 1
INTERPRETATION BY TETRA TECH

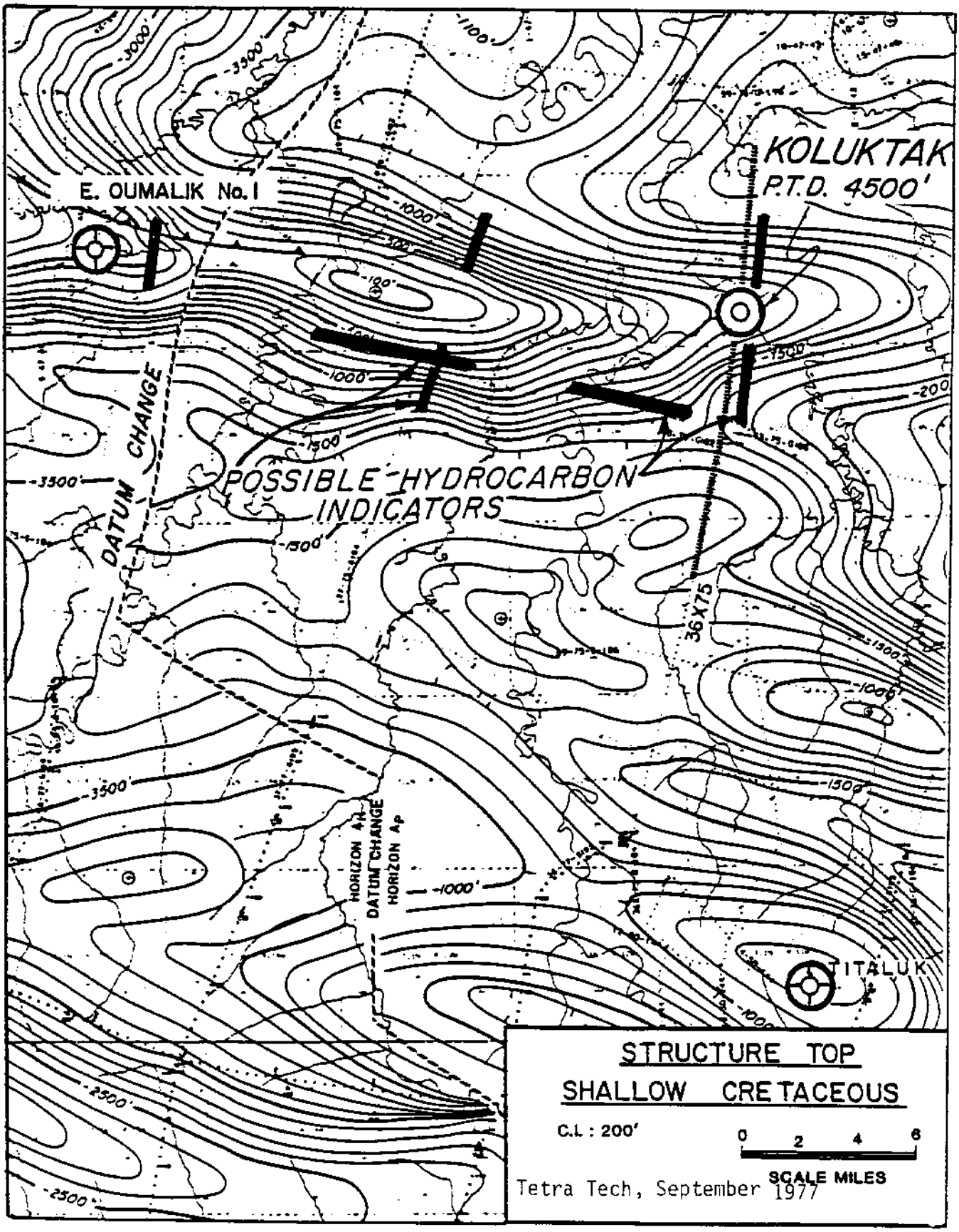


FIGURE 4 - STRUCTURE TOP - SHALLOW CRETACEOUS - KOLUKTAK TEST WELL NO. 1

WELLSITE GEOLOGIST'S REPORT
BY
R. G. BROCKWAY

INTRODUCTION

The Koluktak Test Well No. 1 is located in protracted Section 27, T5N, R11W, Umiat Meridian, approximately 67 miles northwest of Umiat, Alaska. The well was drilled on an indicated seismic structure in shallow Cretaceous rocks (Figures 1, 2, and 4). It was spudded on March 23, 1981, and penetrated only rocks of Early Cretaceous age. Only the Nanushuk Group and a portion of the Torok Formation were drilled. The Nanushuk Group was represented by rocks of the Killik tongue of the Chandler Formation and by rocks of the Grandstand Formation. The well was terminated on April 15, 1981, after drilling 1935' of the Torok Formation.

The major sandstone development was limited primarily to the Grandstand Formation from which minor shows of gas were recorded. One sandstone unit at 3724-3742' contained 2,560 units of gas which took a 1.4 lb. per gallon increase in mud weight to kill. Samples obtained from the lower portion of the sandstone were very fine grained, silty, and clayey. Porosities were computed at 9-14% through the sandstone interval (Appendix C & D). Visible shows with fluorescence and cut were limited to the interval 1560-1660', and these shows were very poor.

No conventional cores were cut, and no drill-stem tests were run. Thirty sidewall cores were shot with 24 recovered.

STRATIGRAPHY

WIRELINE TOPS

	Drilled Depth (BKB)	Subsea Depth
EARLY-LATE CRETACEOUS		
Nanushuk Group	110' samples start	+95'
Chandler Formation		
Killik tongue	110'	+95'
Grandstand Formation	1144'	-939'
EARLY CRETACEOUS		
Torok Formation	3947'	-3742'
TOTAL DEPTH	5882'	-5677'

EARLY-LATE CRETACEOUS

Nanushuk Group: 110-3947'

Chandler Formation

Killik tongue: 110-1144'

The Nanushuk Group of the Koluktak Test Well No. 1 can be divided into two formations--the Chandler and Grandstand. The Chandler Formation is represented by the Killik tongue, a non-marine interval of soft shales, claystones, siltstones, sandstones and thin coal beds. This interval appears to correlate with the Killik tongue as identified in the East Oumalik Test Well No. 1.

The claystones and shales are generally very light to light gray, soft, slightly carbonaceous, silty and partly sideritic. Scattered thin siderite and rare limestone beds occur. Interbedded with the claystones and shales are thin siltstones varying in color from very light gray to gray-brown, slightly carbonaceous and partly sideritic, and sandstones which are generally quite thinly bedded, but in some instances attain thicknesses of 10-17'. One sandstone, 895-933', reaches a gross thickness of 38', but has thin shale and siltstone interbeds. The sandstones of the Killik tongue are very light to light gray, partly "salt and pepper", very fine to fine grained with rare medium-grained beds, subangular to subrounded, partly calcareous, carbonaceous, clayey, silty and partly sideritic. Coaly inclusions and grains and dark chert grains are common. Thin sandstones with poor to fair porosity are present; some have traces of gas but no fluorescence or cut.

Thin lignitic coal beds are common in the Killik tongue, but the coals rarely exceed two feet in thickness.

Grandstand Formation: 1144-3947'

The lower 2803' of the Nanushuk Group is assigned to the Grandstand Formation. Rocks of the Grandstand consist of sandstones, siltstones, and shales. Thin lignite coal beds are moderately common in the upper 1200'.

The sandstones are confined predominantly to the upper 1696' (1144-2840') of the formation, although a few were present in the lower 1107'. Approximately 55-60% of the upper zone is sandstone with individual units varying from a few millimeters to 150' in thickness. The thicker units generally include interbedded thin siltstones and shales. The sandstones are very light to light gray, partly "salt and pepper", very fine to fine grained with a few medium-grained beds, silty, clay filled, partly calcareous, and carbonaceous. Argillite, coal, and dark chert grains are common. Some scattered glauconite grains were also noted.

A study of the electrical logs and drill cuttings reveals that some thin porous sandstone beds are present with a maximum of 23% porosity indicated at 1264-1283'. Minor gas shows were detected in some beds, but only rare fluorescence or cut was seen. All zones appear to be water saturated.

Interbedded with the sandstones are light to dark gray and gray-brown siltstones and medium to dark gray and gray-brown shales and claystones with some light gray and tan streaks. The siltstones are slightly carbonaceous, partly micaceous, and calcareous. The shales are fissile to slightly blocky, slightly carbonaceous, and micromicaceous in part.

The lower 1107' of the formation (2840-3947') is predominantly a siltstone and shale sequence with thin interbedded and interlaminated sandstones generally less than 3' thick. A few sandstone units are as much as 20' thick. All are devoid of hydrocarbons with the exception of one sandstone unit at 3724-3742' where a 2,560-unit gas kick was encountered. No samples were obtained from the upper 10' of this unit because these samples bypassed the shale shakers through the manifold choke while building mud to contain the gas kick. Samples were taken from 3734' and 3740', and these contained light to medium gray, very fine grained, subangular, silty, clayey, slightly calcareous sandstones with no fluorescence or cut. Electric-log computations indicate a water-wet sandstone with 9-14% porosity.

The characteristics of the siltstones and shales of the lower part of the formation are much the same as those of the upper zone other than the tendency to become slightly darker in color. The sandstones become increasingly finer grained with rare fine grained streaks.

Four sidewall cores were attempted between 3725' to 3738'. Three recovered shale; the fourth had no recovery. The recovery of shale in sidewall cores obtained in the sandstone interval (3724-3742') indicates that the sandstone has thin shale interbeds.

Pyrite inclusions are scattered throughout the formation, but become moderately common below 3000'. Scattered fossil fragments, Inoceramus prisms, and foraminifera were observed in the Grandstand Formation.

In the interval 3880' to 3947', there are very thin beds of light gray-green and light gray tuffaceous, bentonitic shales. These beds contain traces of a light green mineral which appears to be a zeolite.

Foraminifera dating by BioStratigraphics assigns the interval 110-3420' an age of Middle to Late Albian (Anderson, Warren & Associates Zone F-9).

EARLY CRETACEOUS

Torok Formation: 3947-5882' (Total Depth)

The Torok Formation is a thinly bedded and interlaminated sequence of siltstone, shale, and sandstone in the upper 900'. The underlying part of the formation becomes finer grained with depth, and below 4950' the rock is almost entirely shale.

The shales of the upper zone are medium to dark gray, occasionally slightly brown, fissile to slightly blocky, micromicaceous and carbonaceous; below 4950' to 5882', they become dark to very dark gray. Siltstones vary in color from light to dark gray and are slightly carbonaceous.

The sandstones are very light to medium gray, very fine grained, subangular, silty, clayey, and carbonaceous. One sandstone unit, with thin interbeds of siltstone and shale, occupies the interval 4137' to 4203'. This sandstone is very light gray to light gray, partly "salt and pepper", fine grained at the top grading downward to very fine grained, subangular, silty, carbonaceous, and has calcite and clay cement. The only hydrocarbon shows observed in the Torok were slight gas shows at the top of this sandstone unit where there were readings of 250 units at 4133-4143' and 255 units at 4147-4157'.

BioStratigraphics, in the final foraminifera report, assigned the interval 3420-5882' (total depth) an Aptian-Albian age (AWA F-10).

No conventional coring was performed in the Koluktak No. 1. Thirty sidewall cores were shot and 24 recovered in the Grandstand and Torok Formations.

STRUCTURE

The Koluktak Test Well No. 1 was drilled on an east-plunging nose of a seismically located high with a local crest about 12 miles to the west (Figure 4). The structural nose on which Koluktak was drilled is on the eastern end of the Oumalik anticlinal trend. The closest correlating wells are the U. S. Navy East Oumalik No. 1, 23 miles to the west, and the U. S. Navy Titaluk No. 1, 24 miles south (Figure 4).

It appears that the Koluktak No. 1 was drilled structurally lower than either of the correlating wells. Although correlations are only approximate between the wells, the Koluktak No. 1 correlates best with the East Oumalik No. 1.

A study of the dipmeter log shows that there is a general southeast dip of 1-2° in the rocks to a depth of 4100'. The dip increases to 17-18° at 4100' and persists to a depth of 4440'. There is a slight anomaly from 4420' to 4440', but whether this represents a fault zone is not known. At 4440' the direction of dip abruptly changes to the northeast, but the rates remain at 16-18° to 4700', with an increase to 24° from 4700-4750'.

From other anomalies present on the dipmeter log, it appears that faulting has taken place at 4750-4800' and at 4950'. A change in dip direction from northeast to southeast is present between 4800' and 4950' which may be due to drag or displacement by the faults mentioned.

Below 4950', the direction of dip is again to the northeast and north with dip rates varying from 2-14°.

There is a possible anomaly that occurs with a dip reversal from 3740-3800', immediately below the gas sand at 3724-3742'. A small fault may occur within the gas sand. The fault could then serve as a conduit for the gas occurring at this point, but because this anomaly occurs within a sandy interval, the log may be reading stratigraphic dips in the sandstones.

Although very little evidence of faulting or fracturing was observed in the drill cuttings, the presence of clear and white calcite may indicate thin calcite-filled fractures. The calcite is most common below the Torok top at 3947'.

HYDROCARBON INDICATIONS

By the use of a binocular microscope, ultraviolet light, chloroethane and a hydrogen-flame chromatograph, the drill cuttings, sidewall cores, and drilling mud were examined and monitored for hydrocarbons.

Minor shows of gas were detected from sands and coals in the lower Killik tongue of the Chandler Formation and in the Grandstand Formation but there were only rare occurrences of faint fluorescence or cut. One sandstone unit at 3724-3742' had a 2,560-unit gas kick which required a 1.4 lb. per gallon increase in mud weight to kill.

Only one other zone had any gas worth mentioning, and it was at the top of a sandstone at 2220-2248'. Here 700 units of gas were detected, but no fluorescence or cut was observed.

Hydrocarbon shows in the Torok Formation were limited to minor gas kicks at 4133-4143' (250 units) and 4147-4157' (255 units).

A study of the electric logs shows that although zones with porosities as high as 23% were present, most appear to have a high argillaceous and/or calcareous content which would make permeabilities low.

No tests were undertaken as all porous zones were computed to be water saturated.

CONCLUSIONS

It is hereby concluded that:

a. Information from the Koluktak Test Well No. 1 has been evaluated, and the well is considered a dry hole for the production of hydrocarbons.

b. A stratigraphic trap does not exist on the west, at least in the vicinity of the Koluktak well.

PERTINENT DATA AND APPENDICES

Appendix

SUMMARY PERTINENT DATA, OPERATIONS & ANALYSIS

WELL NAME:	Koluktak Test Well No. 1
API NO.:	50-119-20001
OPERATOR:	Husky Oil NPR Operations, Inc.
LOCATION:	65' FSL, 1555' FWL SW 1/4, protracted Section 27, T5N, R11W Umiat Meridian, Alaska
COORDINATES:	Latitude: 69°45'08.62" North Longitude: 154°36'40.12" West X = 422,531.28, Y = 5,759,254.45 Zone 5
ELEVATIONS:	205' Kelly Bushing (KB), 183' Ground, 185' Pad
CASING:	20" @ 106' 9-5/8" @ 1525'
DATE SPUDDED:	March 23, 1981
TOTAL DEPTH:	5,882 feet
DATE REACHED TOTAL DEPTH:	April 15, 1981
DATE RIG RELEASED:	April 19, 1981

LOGGING RECORD:

DIL/DLL/GR/SP	106-5878'
BHCS/GR/TTI	106-5870'
Sonic Log (Long Space)/GR/TTI	107-1526'
CNL/FDC/GR/CAL-0	102-5876'
FDC/GR/CAL/RR	102-5876'
HDT Dipmeter - Corr. Curves	1564-5805'
HRT Temperature -	
Run No. 1 before logging	110-5872'
Run No. 2 after logging	53-5400'
Velocity Survey	250-5800'
Drilling Data Pressure Log	110-5882'
Formation Evaluation Log (Mud Log)	110-5882'
Computed Logs:	
Dipmeter Arrow Plot	1546-5805'
Saraband	126-1532' 1530-5840'

SIDEWALL CORES:	Shot 30; recovered 24
CONVENTIONAL CORES:	None
DRILL STEM AND PRODUCTION TESTS:	None
CORE ANALYSIS:	None
FLUID ANALYSIS:	None
STATUS:	Plugged and abandoned
WELLSITE GEOLOGIST:	Ronald G. Brockway
CONTRACTOR:	Nabors Alaska Drilling, Inc., Rig 17
MUDLOGGERS:	Exploration Logging Company
BIOSTRATIGRAPHIC ANALYSIS:	BioStratigraphics

KOLUKTAK TEST WELL NO. 1
DRILL CUTTINGS DESCRIPTIONS

BY
R. BROCKWAY - 110-5882'

NOTE: Samples have been lagged, but the descriptions below have not been adjusted to correspond with electric log depths. See Composite Lithology Log for correct depths versus lithology.

DEPTH DRILLED (FEET BELOW KELLY BUSHING)	
0 - 110	No recovery.
110 - 123	Sandstone: very light to light gray, fine grained, subangular, calcareous, clay cement, carbonaceous grains and coaly inclusions, chlorite grains and scattered chert pebbles; interbedded Siltstone: tight; no show.
123 - 156	Siltstone: light to dark gray, gray-brown, interbedded with Sandstone: very light to light gray, very fine to fine grained, clayey, silty, subangular, tight; no show, and Shale: light to dark gray, partly very silty.
156 - 162	Coal: black, lignite.
162 - 196	Siltstone: very light gray to gray-brown, partly carbonaceous, clayey in part, interbedded with Sandstone: light gray, as above, partly medium to coarse grained, loose, varicolored, chert, argillite and coal grains common, and Claystone: very light to light gray and tan, sideritic, trace of light gray Shale, Siderite and Marlstone beds.
196 - 220	Sandstone: light and very light gray, very fine to fine grained, subangular, very calcareous, slightly clayey, carbonaceous, coaly partings, partly sideritic, very thin bedded, interbedded Shale, Siltstone, and Siderite, thin coal bed at base.
220 - 240	Siltstone: very light to light gray, micaceous, partly carbonaceous, with interbedded Claystone and Shale: very light gray, light tan, partly sideritic, partly fissile, trace gray-brown carbonaceous Shale.
240 - 286	Sandstone: very light to light gray, very fine to fine grained, subangular, calcareous, partly silty and clayey, rare glauconite, carbonaceous flakes, rare siderite stringers, thin black lignite beds.

286 - 482	Siltstone: very light to light gray, micaceous, partly tan and sideritic, carbonaceous, interbedded with Claystone and Shale: buff to gray-brown, partly sideritic and carbonaceous, and Sandstone: light to very light gray, as above, thin black lignite beds.
482 - 494	Sandstone: light gray, fine grained, subangular, calcareous, slightly dolomitic, trace clay and silt, carbonaceous flakes and grains, slight porosity; no fluorescence or cut; 60 units gas.
494 - 520	Sandstone, as above, interbedded with Siltstone: light gray, carbonaceous, slightly calcareous, trace clay and claystone, and Shale: light brown to light gray, partly sideritic and silty; Siderite: light brown to gray-brown,
520 - 527	Sandstone: light gray, very fine to fine grained, subangular, calcareous, trace clay, silty, carbonaceous, trace micaceous, tight; no fluorescence or cut.
527 - 792	Claystone: very light gray, buff, tan, partly sideritic, silty, partly carbonaceous, interbedded with Siltstone: light gray to tan to gray-brown, partly sideritic and carbonaceous, and Sandstone: very light and light gray, very fine grained, rarely fine grained, subangular, partly calcareous, carbonaceous, scattered siderite and coal stringers.
792 - 810	Sandstone: light gray, "salt and pepper", fine grained, subangular to subrounded, clay and calcite cement, coal and dark chert grains, occasional coal granules; no fluorescence or cut, siltstone and shale interbeds.
810 - 895	Sandstone: as above, interbedded with Siltstone: light gray to gray-brown, and Claystone: buff to light brown, sideritic, partly sandy and silty, slightly carbonaceous, trace coal and siderite beds.
895 - 933	Sandstone: light gray, "salt and pepper", medium to fine grained, subangular to subrounded, calcareous, clayey, coal and dark chert grains, becomes very fine grained downward, fair porosity; no fluorescence or cut, claystone and siltstone interbeds.
933 - 1144	Siltstone: light gray to gray-brown, partly sideritic, partly micaceous, slightly micaceous, interbedded with Sandstone: light gray, partly "salt and pepper", medium to very fine grained, subangular to subrounded, calcareous, partly sideritic, carbonaceous, and Claystone: light gray to tan, partly sideritic, thin lignite coal beds common.

1144 - 1157	Sandstone: light gray, very fine to fine grained, subangular, clayey, calcareous, partly very calcareous, hard, carbonaceous, partly graywacke, tight; no fluorescence or cut.
1157 - 1208	Siltstone: light gray to gray-brown, slightly micaceous and carbonaceous, interbedded with Sandstone: light and very light gray, partly "salt and pepper", very fine to medium grained, partly calcareous, slightly sideritic, clayey, tight; no fluorescence or cut, and Claystone: gray to tan, partly sideritic, rarely calcareous.
1208 - 1236	Sandstone: gray with light gray streaks, very fine to fine grained, subangular to subrounded, silty, clayey, carbonaceous, partly calcareous, tight; no show, rare pyrite inclusions and siderite stringers, siltstone and shale interbeds.
1236 - 1264	Shale: dark gray, gray-brown, fissile, micromicaceous, carbonaceous, interbedded with Sandstone: as above, and Siltstone: gray, light gray, carbonaceous, slightly micaceous.
1264 - 1410	Sandstone: "salt and pepper", medium grained, coarse grains common, scattered chips with white clay cement, subangular to angular, coal, argillite and scattered light and dark gray and brown chert grains, partly altered, rare green grains, good porosity; no fluorescence or cut, becomes light gray, fine to medium grained, subangular, calcareous, siliceous, clayey, porous streaks at 1296', some siltstone laminations; becomes very fine grained, partly silty with increasing carbonaceous material and thin dark gray shale beds below 1350'.
1410 - 1426	Shale: gray-brown, slightly carbonaceous with Claystone: tan and light brown, sideritic, and coal and siderite stringers.
1426 - 1435	Sandstone: light and medium gray, very fine grained, subangular, silty, carbonaceous, clayey; no shows.
1435 - 1446	Siltstone and Shale: medium to light gray, gray-brown, carbonaceous, with coal beds.
1446 - 1469	Sandstone: as above, with interbedded shale and siltstone.
1469 - 1510	Siltstone: gray to gray-brown, carbonaceous, and Shale: dark gray-brown, carbonaceous, with interbedded Sandstone: very light gray, very fine to fine grained, clayey, silty, slightly calcareous, carbonaceous, slight porosity; no fluorescence or cut.

1510 - 1538	Sandstone: "salt and pepper", light gray, medium grained, occasional coarse grains and granules, subangular, clayey, light gray to black and brown chert grains, fine grained streaks, trace chert pebbles, streaks with fair porosity; no fluorescence or cut; siltstone and shale stringers.
1538 - 1542	Sandstone: as last described.
1542 - 1580	Shale: gray, gray-brown, fissile with interbedded siltstone and sandstone, coal stringers.
1580 - 1600	Sandstone: light and medium gray, very fine to medium grained, subangular, rare granules, carbonaceous, silty, clayey, slightly siliceous, siltstone and shale stringers; faint light yellow fluorescence, faint light bluish-yellow crush cut.
1600 - 1635	Shale: light to medium gray, trace dark gray, fissile, carbonaceous flakes, interbedded siltstone and sandstone.
1635 - 1662	Sandstone: "salt and pepper", fine to medium grained, subangular, clayey, carbonaceous, slightly siliceous, scattered light gray tripolitic chert grain, some porous streaks; faint light yellow fluorescence, faint light bluish-yellow crush cut; trace coal and claystone stringers.
1662 - 1668	Siltstone and Shale: light to medium gray.
1668 - 1715	Sandstone: very light gray, partly "salt and pepper", fine to very fine grained, subangular, clayey, silty, carbonaceous, coal and chert grains; no fluorescence or cut.
1715 - 1756	Sandstone: as above, interbedded with Shale: medium and dark gray, and Siltstone: medium to light gray, rare coal stringer.
1756 - 1786	Sandstone: very light gray, slightly "salt and pepper", fine to very fine grained, subangular, clayey, slightly calcareous, and siliceous, tight; no shows with interbedded shale and siltstone, coal stringers, thin brown siderite bed at base.
1786 - 1835	Sandstone: as above, with interbedded shale and siltstone, becoming partly medium grained, coal stringers common in lower 20', thin light gray, very argillaceous limestone at base.
1835 - 1857	Sandstone: as above, thinly interbedded with light and medium gray siltstones and medium gray to light gray-brown shales.

1857 - 1880	Sandstone: very light gray, fine grained, subangular, clay cement, slightly calcareous, rare glauconite grain, coal, argillite and chert grains, fair porosity; no fluorescence or cut, trace gas; shale and siltstone stringers.
1880 - 1887	Siltstone: light to medium gray, coal parting.
1887 - 1893	Sandstone: light gray, partly "salt and pepper", fine grained, subangular, slightly calcareous, clayey; no fluorescence or cut.
1893 - 1910	Shale: light to medium gray, partly claystone, slightly micromicaceous, and Siltstone: light to medium gray, thin lignitic coal bed.
1910 - 1926	Sandstone: light gray, "salt and pepper", fine grained, subangular, rare glauconite, slightly calcareous, clay matrix, shale stringers with coal parting; no shows.
1926 - 2024	Sandstone: as above, becoming very fine grained, interbedded with Shale and Claystone: light gray to dark gray-brown, partly carbonaceous, partly silty, and Siltstone: light to medium gray, partly sandy and clayey, slightly carbonaceous.
2024 - 2076	Sandstone: light to medium gray, fine to very fine grained, subangular to angular, white clay cement, calcareous, carbonaceous, tight; no shows; siltstone and shale beds 2040-2047', thin coal bed at base.
2076 - 2222	Sandstone: light gray, fine to very fine grained, subangular, clayey, silty, carbonaceous, slightly calcareous, interbedded with Shale: light gray to gray-brown, fissile, carbonaceous, occasional light brown sideritic shale stringers, and Siltstone: light to dark gray, slightly carbonaceous and calcareous, a few coal stringers, coal beds common in lower 40 feet.
2222 - 2249	Sandstone: "salt and pepper", fine grained, subangular to subrounded, calcite and white clay cement, carbonaceous and coal grains, pyrite inclusions, tight to slightly porous; pale white mineral fluorescence, no cut, 700 units of gas.
2249 - 2271	Siltstone: light to dark gray, slightly calcareous and carbonaceous, interbedded with Shale: light gray to light brownish-gray, fissile, with scattered subbituminous coal stringers.
2271 - 2316	Sandstone: "salt and pepper", light gray, medium grained becomes finer downward, subangular to angular,

	friable, white clay matrix, coal, argillite and dark chert grains, fair porosity in streaks; trace gas, no fluorescence or cut.
2316 - 2333	Shale: medium gray, brownish-gray, partly micromicaceous, fissile, slightly carbonaceous, with Siltstone: medium gray, gray-brown, slightly carbonaceous, thin coal stringer.
2333 - 2487	Sandstone: very light gray, "salt and pepper", fine grained, subangular, white clay matrix, argillite and coal grains, scattered siderite and glauconite grains, decreasing grain size downward to very fine grained, becomes very thin bedded and interlaminated with siltstone and shale, rare coal parting and pyrite inclusions.
2487 - 2508	Shale: light to dark gray, gray-brown, fissile, carbonaceous, with Siltstone: dark gray, gray-brown, carbonaceous, thin coal stringers.
2508 - 2526	Sandstone: light gray, very fine to fine grained, subangular to subrounded, silty, very clayey, tight; no shows; shale and siltstone interbeds.
2526 - 2547	Shale: light to medium gray, gray-brown, fissile, carbonaceous, interbedded with Sandstone: as above, and Siltstone: dark gray, gray-brown, carbonaceous streaks.
2547 - 2640	Sandstone: light gray, fine grained, subangular to subrounded, clay cement, slightly siliceous, argillite, coal and dark chert grains, tight; no fluorescence or cut, trace gas; becomes very fine grained below 2583'. with interbedded Siltstone: light to medium gray, carbonaceous, and Shale: medium to dark gray, carbonaceous, micaceous, rare coal parting.
2640 - 2700	Sandstone: light and very light gray, slightly "salt and pepper", fine grained, subangular, clay and calcite cement, carbonaceous, scattered chlorite and glauconite grains, rare reddish-brown grain, streaks with poor to fair porosity; no shows; interbedded shale and siltstone.
2700 - 2736	Siltstone: medium to light gray, carbonaceous, trace mica, thin interbedded shale and sandstone.
2736 - 2783	Sandstone: light gray, "salt and pepper", coarse to medium grained, fine grained streaks, scattered very coarse grains, subangular to angular, clay and calcite cement, coal, argillite, chert and chlorite grains, streaks with poor porosity; no shows; becomes sideritic and siliceous at base, thin interbedded shale and siltstone.

2783 - 2789	Shale: medium to dark gray.
2789 - 2798	Sandstone: light gray, very fine to fine grained, subangular, clayey, carbonaceous; no shows.
2798 - 2825	Siltstone: medium to dark gray, carbonaceous with interbedded shale.
2825 - 2839	Sandstone: light gray, fine grained, subangular, clayey, calcareous, carbonaceous, rare glauconite grain, tight; no shows.
2839 - 2895	Siltstone: medium to dark gray, carbonaceous, partially pyritic, with interbedded Shale: medium to dark gray, fissile, slightly micaceous, trace of Sandstone: as above.
2895 - 2917	Sandstone: medium to light gray, very fine grained with fine grained streaks, subangular, silty, clayey, calcareous, slightly carbonaceous, tight; no shows; a few shale and siltstone interbeds.
2917 - 2964	Siltstone: medium to dark gray, trace light gray, carbonaceous, with interbedded Shale: medium to dark gray, fissile, slightly micaceous, rare sandstone stringers, as above.
2964 - 2980	Sandstone: light gray, very fine grained, subangular, silty, clayey, calcareous, carbonaceous, trace mica, tight; no shows.
2980 - 3072	Siltstone: light to dark gray, calcareous to shaly, carbonaceous, with interbedded Shale: medium to dark gray and thin sandstone stringers, becomes shale with siltstone laminations below 3025'.
3072 - 3194	Sandstone: light and very light gray, very fine to fine grained, subangular, clayey, calcareous, carbonaceous, slightly micaceous, interbedded with Siltstone: light to medium gray, calcareous to shaly, micaceous, and Shale: medium to dark gray, partially gray-brown, micaceous, trace pyrite.
3194 - 3213	Sandstone: very light and light gray, very fine to fine grained, subangular, calcareous, clayey, carbonaceous, tight; no shows; shale and siltstone interbeds.
3213 - 3547	Siltstone: medium to dark gray, carbonaceous, slightly calcareous in part, thinly interbedded and interlaminated with Shale: medium to dark gray, fissile to slightly blocky, micromicaceous, and Sandstone: light to medium gray, very fine grained, subangular, silty, slightly calcareous, clayey, rare mica flakes, scattered shell fragments and pyrite inclusions.

3547 - 3593	Shale: medium to dark gray, very slightly carbonaceous, fissile to blocky, with interlaminated Siltstone: light to dark gray, scattered glauconite pellets.
3593 - 3604	Sandstone: very light to medium gray, very fine grained, subangular, silty, argillaceous, calcareous, carbonaceous, scattered argillite and white altered grains, few fine grained streaks, tight; no shows.
3604 - 3716	Siltstone: light to medium gray, partly calcareous, partly shaly, micaceous, carbonaceous, with thin interbedded Shale: medium to dark gray, brownish-gray, fissile, scattered pyrite inclusions, and Sandstone: light to medium gray, very fine grained, subangular, silty, argillaceous, very slightly calcareous, rare, fine and medium grained streaks, tight; no shows.
3716 - 3733	No samples circulated through manifold choke, 2,560 unit gas kick; mud highly gas cut, 1.4 pound increase in mud weight required to kill well.
3733 - 3742	Sandstone: light to medium gray, very fine grained, subangular, silty, argillaceous, very slightly calcareous, carbonaceous, occasional biotite flakes, trace light buff altered grains, tight; no fluorescence or cut.
3742 - 3764	Shale: medium to dark gray, trace gray-brown, fissile, some silty streaks, interbedded with Siltstone: light gray to medium gray, slightly carbonaceous, and Sandstone: as above.
3764 - 3778	Sandstone: light to medium gray, very fine grained, as above, tight; no fluorescence or cut.
3778 - 3787	Siltstone and Shale: light to dark gray.
3787 - 3817	Sandstone: very light to light gray, very fine to fine grained, subangular, silty, clayey, calcareous to very calcareous, carbonaceous, slightly micaceous, pyrite inclusions, rare foraminifera, tight; no shows; interbedded Shale: medium to dark gray, and Siltstone: light to dark gray.
3817 - 3946	Shale: dark to medium gray, brownish-gray, fissile to slightly blocky, becoming light gray to black below 3900', trace pyrite, rare gray chert inclusions interbedded with Siltstone: light to dark gray, partly shaly or sandy, partly calcareous, and Sandstone: very light to light gray, very fine to fine grained, subangular, clay and calcite cement, silty, carbonaceous, slightly micaceous; no shows; streaks light gray-green tuffaceous shale, trace light green zeolite and light gray bentonitic shale below 3900'; rare foraminifera, a few calcite veins.

3946 - 4137	Shale: medium to dark gray, slightly brown, fissile to slightly blocky, micromicaceous, thinly interbedded and interlaminated with Siltstone: light to medium gray, trace dark gray, slightly carbonaceous, and Sandstone: light to very light gray, very fine grained, subangular, silty, clayey, carbonaceous, pyrite stringers and inclusions, scattered calcite veins; siliceous shale inclusions, light and dark chert inclusions, trace bentonitic shale and claystone; occasional slickensides in upper 30'.
4137 - 4203	Sandstone: very light to light gray, slightly "salt and pepper", fine to very fine grained, subangular, silty, clay and calcite cement, carbonaceous, rare glauconite, tight; no fluorescence or cut; trace gas.
4203 - 4462	Shale: medium to dark gray, fissile, carbonaceous, micromicaceous, very thin bedded and interlaminated with Sandstone: very light to light gray, very fine to fine grained, subangular, clay and calcite cement, carbonaceous, and Siltstone: light to dark gray, pyrite inclusions, scattered Inoceramus prisms, thin coal partings.
4462 - 4615	Shale: medium to dark gray, streaks gray-black, micromicaceous, fissile to slightly blocky, bentonitic shale streaks, slightly siliceous below 4550', thin bentonite stringers, thin interbedded siltstone and sandstone, scattered Inoceramus.
4615 - 5050	Shale: dark gray, brownish-gray, light gray streaks, micromicaceous, fissile to blocky, occasional bentonitic shale streak, thin interbedded siltstone and sandstone, scattered Inoceramus and foraminifera.
5050 - 5882	Shale: dark to very dark gray, fissile, micromicaceous, slightly carbonaceous with interlaminated Siltstone: medium to dark gray, pyrite inclusions, scattered Inoceramus and foraminifera, rare glauconite pellets, rare coal partings, some calcite veins or calcite-filled fractures.

Total Depth: 5,882 feet.

Log Analysis

ARMOUR KANE

Well Log Analyst
18360-6 Cantara St
Reseda, Ca. 91335
(213) 993-0586

Formation Evaluation

April 24, 1981

Mr. S. L. Hewitt
Husky Oil/NPR Operations, Inc.
2525 C Street
Anchorage, Ak 99503

Dear Mr. Hewitt:

Schlumberger began logging at Koluktak Test Well No. 1 at 2230 hours April 15, 1981, and finished two temperature surveys, DLL, GNL/FDC, BHC, HRD Dipmeter, Birdwell Velocity survey and sidewall cores at 1400 hours April 17, 1981. Log quality was good but the first temperature log was quite hasny. The engineer fouled up in recording the dipmeter, running a 5" paper log and a 60" film which will be converted to a 5" film at the computer center. The bulb in the field printer burned out and films had to be taken to the Awuna well in order to get the necessary prints. Birdwell experienced some delay in getting set up but their records were satisfactory. 24 of 30 sidewall cores were recovered. No SP was run with the DLL since it was essentially a straight line and served only to clutter up track one of the log which recorded gamma ray and caliper.

Top of the Torok was tentatively picked at 4212 feet although this could be open to question.

There were no zones of particular interest although some of the up-hole sands exhibited fairly good porosities of up to 16% but all were water bearing. (See attached tabulation) Two intervals, 2270-80 and 3789-94, may have some hydrocarbon content if one applies the Rwa values close to the zones with Sw of about 70% and 65% respectively, but nothing in commercial amounts.

Very truly yours,

A. Kane

A. Kane

Log Analysis

COMPANY: HUSKY OIL/NPR OPERATIONS, INC.
WELL: KOLUKTAK Nº 1
FIELD: NPR #4
COUNTY: NORTH SLOPE
STATE: ALASKA

DEPTH	R_T	ϕ_D	ϕ_N	R_{wa}	REMARKS
1860-70	11	16	30	.32	
1918-26	20	10	29	.22	
2270-80	20	15	29	.50	
2290-2300	22	10	31	.25	
2950-60	20	12	24	.31	
3723-32	18	9	25	.17	
3734-40	8	14	33	.18	
3789-94	20	14	28	.44	

HUSKY OIL NPR OPERATIONS, INC.
U.S. GEOLOGICAL SURVEY/ONPRA

LOGGING REPORT

WELL NAME KOLUKTAK #1

Date March 28, 1981 Driller Depth 1538'

Elevation KB 205 GR 183 Logger Depth 1542'

Logs Ran and Intervals

DIL/SP/GR	106-1536'
CNL/FDC/GR/CAL	106-1540'
BHCS/GR/TTI	106-1537'
LSS/GR	106-1526'

Additional Logs to Run

None

Zones of Interest

Depth	Gross Thickness	Net Feet of Porosity	Lith	Porosity	Probable Fluid Content
1145-1154	9'	9'	SS	17%	wtr
1264-1283	19'	19'	SS	23%	wtr

Discussion:

These two zones are the only ones thick enough to warrant any calculations. Rest of log appears to be very fine bedded material. Sands appear to be water wet.

Log Tops & Correlations:

Nanushuk Group	-	Surface
(Grandstand mbr)?	-	1264 ?

Additional Evaluation Plans:

None

RON BROCKWAY
Wellsite Geologist

D-1
Log Analyst

12/77

HUSKY OIL NPR OPERATIONS, INC.
U.S. GEOLOGICAL SURVEY/ONPRA

LOGGING REPORT

WELL NAME KOLUKTAK TEST WELL No. 1

Date 4/15-17/81 Driller Depth 5882'

Elevation 205 K.B. Logger Depth 5880'

Logs Ran and Intervals

HRT - Temp (2)	110-5872'	Birdwell Velocity Survey - Top 250' - Bottom 5860'
GR/CAL/DLL/MSFL	1524-5878'	Sidewall Cores - Top 1584' - Bottom 5517'
GR/CAL/CNL/FDC	1524-5876'	
GR/BHC	1523-5870'	
HRD - Dipmeter	1524-5870'	

Additional Logs to Run

None

Zones of Interest

Depth	Gross Thickness	Net Feet of Porosity	Lith	Porosity	Probable Fluid Content Sw
2270-80	10	10	SS	15%	75% Water
3723-32	9	9	SS	9%	Water
3734-40	6	6	SS	14%	Water
3789-94	5	5	SS	14%	64%± Water
NO ZONES OF REAL INTEREST					

Discussion:

Rwa Valves in the up-hole sands is fairly consistent at .28-.32. No SP was run with the DLL since it was essentially a straight line and only served to clutter up track one of the log.

Log Tops & Correlations:

Torok 4212'±

Additional Evaluation Plans:

None

R. BROCKWAY
Wellsite Geologist

D-2

A. Kane
Log Analyst

LISTING OF OTHER AVAILABLE GEOLOGICAL DATA

1. Final Biostratigraphic Report - Palynology, BioStratigraphics, May 15, 1981.

2. Final Biostratigraphic Report - Foraminifera, BioStratigraphics, May 18, 1981.

3. History of Drilling Operations, Koluktak Test Well No. 1, Husky Oil NPR Operations, Inc., September 1982.

SOURCE OF OTHER GEOLOGICAL AND WELL DATA

Copies and some reproducibles of information referenced in this report which was generated as part of the USGS/NPRA exploration effort, can be obtained by contacting:

National Oceanic and Atmospheric Administration
EDIS/NGSDC (D62)
325 Broadway
Boulder, CO 80303